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A GUIDE TO THE FEEDING OF  
THE INFANT



A GUIDE TO THE  
FEEDING OF THE INFANT  
DURING THE FIRST YEAR

BY

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## P R E F A C E

THE great and growing interest evinced in modern days in physical education—an interest which expresses itself in the medical inspection of school children, and in increased attention to all matters of school hygiene—is one of the most hopeful and encouraging signs of progress at the present day. It seems very necessary to point out, however, especially in view of the alarmingly high death-rate of infants under one year old, that the foundation of a sound physical frame is laid *before* the school age is reached at all; and as nothing is more important, especially during the crucial first year of life, than a properly constituted and properly regulated diet, it is hoped that this little book, *Infant Feeding during the First Year of Life*, may prove useful and helpful in this connection.

J. W. SIMPSON.

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PART I

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BREAST FEEDING



## BREAST FEEDING

A HEALTHY infant at birth usually cries lustily. This is a most beneficial as well as a perfectly natural act; and is the means by which the lungs are expanded and filled with a supply of air. When, however, the crying continues for some little time, it is often assumed that the baby is hungry and requires nourishment, and this idea is strengthened by the fact that from time to time the tiny fist is thrust into the mouth.

Acting on this supposition, a mixture consisting usually of sugar and water, or milk and water, is forthwith prepared by the nurse, and given to the infant without further loss of time.

Such treatment, however, may have an injurious effect on the child. It is unable at this early stage to digest the sugar, and consequently irritation of the stomach may be set up, though it must be admitted that many children show no ill effects whatever from such feeding. But why run any unnecessary risks? The new-born infant requires no nourishment, and if the crying continues for some time after birth a teaspoonful or two of cooled sterilised water is all that should be given. As a rule, however, the baby, after being washed and dressed, seems quite contented and happy, in which case it should be placed in its cot and left alone for the time being.

### Feeding after the first Twelve or Eighteen Hours

What has just been said holds good for twelve or eighteen hours after birth; but as the infant's proper nourishment—the mother's milk—is not secreted until the third day, we have now to consider how to feed the baby during that period.

After twelve or eighteen hours, if the mother is not too exhausted, the child may be placed at the breast, which, although it secretes as yet no real milk, contains a small quantity of a fluid somewhat resembling it, though slightly different in colour and thicker in consistence. This fluid is called 'colostrūm,' and supplies the child with a certain amount of nourishment, while it is also advantageous in this respect, that by its action it clears out of the bowels the dark, almost tarry-looking substance known as 'mæconium.' A still further advantage in putting the child thus early to the breast is, that it accustoms it to catch and retain the nipple. The nursing should be repeated every six hours or so until the milk proper becomes fully established.

Most babies, however, require some additional nourishment, which is best given in the form of milk sugar diluted with sterilised water in the proportion of one teaspoonful of milk sugar to a breakfast cupful of water. It is important to understand that this sugar of milk is, of course, different from the ordinary commercial sugar, and resembles closely in composition the sugar found in the milk of the mother. In the case of a particularly big child, who cries frequently, the food may be varied to include three or four teaspoonfuls of a mixture consisting of one teaspoonful of milk to

six or eight teaspoonfuls of sterilised water. This may be given every three or four hours; but no regular times of feeding can be laid down during the first three days; the child should simply be allowed to sleep as much as possible.

On the third day, however, the milk usually appears in the mother's breast, and from this time forward a careful and methodical system should be adhered to in the nursing of the child.

### **Breast Feeding**

Two rules of paramount importance may first of all be briefly stated :—

1. The child should always be fed at certain regular and stated hours.
2. The child should not be allowed to remain at the breast more than fifteen or at most twenty minutes.

During the first six weeks or two months the child should be put to the breast every two hours throughout the day, and not on any account oftener than twice during the night, which may be reckoned as from 10 P.M. to 8 A.M. The first morning feed would therefore be given at 8 o'clock, the next at 10, the next at 12, and so on; the last day feed being given at 10 P.M. The baby should then be allowed to sleep as long as possible, and should it require only one feed during the night, so much the better. If more convenient for the mother, the night may be reckoned from 9 P.M. to 7 A.M., instead of from 10 to 8—this, of course, would alter the day feeds by one hour.

After the first six weeks or two months the intervals

between each feed should be extended to two and a half hours throughout the day, but two feeds at night may still be given, if required.

After the fourth month the baby should only be nursed every three hours during the day, and not oftener than once during the night; and this arrangement may be continued uninterruptedly up till the sixth or seventh month, with this single exception, that during the later months the night feed should be discontinued altogether, if possible.

### **The Necessity for Regular Feeding**

Why is it so necessary to feed the infant with the utmost regularity? There are several reasons, all of them most important. For one thing, children are the creatures of habit, and it is wonderful how soon they learn to waken up at regular intervals for their food and then drop happily off to sleep again—thus saving the mother a great deal of unnecessary trouble and worry. On the other hand, when no regular hours of nursing are adhered to, how often does the baby turn day into night and night into day; sleeping during the greater part of the daytime, and as a consequence waking up frequently during the night, crying and hungry.

Now most mothers, in addition to the strain of nursing, have household work and duties to perform. How is it possible to continue healthy and well if the night's rest be disturbed in this way? It is a well-known fact that sleep and rest are essential to a nursing mother; for if she fail to secure them, the quality of her milk deteriorates, and thus her poor condition of health reacts unfavourably on her child.

It is true that some women nurse their babies at any time, and seem to have very little trouble with them. They thrive well, and are what the mother describes as a 'good baby.' Misled by such appearances, many people are apt to imagine that adherence to regular and settled hours in feeding is of no particular consequence. If, however, they only had the opportunity of investigating amongst a large number of children the results of such haphazard methods of feeding, they would soon have their eyes opened, not only to the dangers, but also to the positive cruelty which such treatment inflicts on the infant. The stomach of a baby is much more easily thrown out of order than that of an older person. Why then should we treat it less carefully and intelligently? Why should we so neglect to regulate the child's hours of feeding?

A grown-up person does not eat at all times—he has more common sense; he keeps more or less regular hours, or if he does not, an attack of indigestion usually reminds him that he is transgressing against the rules of health. Yet many well-meaning mothers give their baby the breast whenever it cries. Half an hour previously, perhaps, the child has been completely satisfied; and the additional feed overloads its delicate stomach with food, and induces an attack of indigestion.

Now, every adult who has suffered from indigestion knows that there is often a great craving for food, which, if taken, frequently stops the pain and uneasiness for some little time; but no sensible person would ever dream of treating indigestion in this way. It affords merely a temporary relief

at the expense of aggravating and continuing the condition.

As with the adult, so with the child. The indigestion caused by overfeeding may be soothed for some little time after a drink is taken, but in twenty minutes or so the pain returns, and many mothers mistakenly give the breast once more to stop the crying, though it can be readily understood that such treatment only makes matters worse. This error of over-feeding is one which some women are apt to fall into, more especially at night, when, tired out after a hard day's work, and kept awake by a crying infant, they, with shortsighted policy, try to secure a little sleep and rest at any price. The means, however, entirely defeat the end they have in view.

Lastly, irregular and over-frequent suckling stimulates the mother's breast too much, and affects the quality of the milk by increasing the solids in it. As a consequence it is rendered much more indigestible, and thus gives the already overloaded stomach of the baby increased work to do.

### **Length of Time allowed at the Breast**

As it is impossible to judge accurately the amount of milk taken by the infant at each feeding period, it is safer to judge, not by amount at all, but by time. The child can soon be made to understand that it is expected to begin sucking as soon as the breast is offered, and to continue steadily to do so for the next ten or at most twenty minutes. This should allow an ample supply of milk, even to a child whose sucking powers are somewhat defective, or who is sucking

from a nipple through which the milk flows rather slowly. If the breast is empty before the feed is ended, the other breast may also be given; but in the generality of cases, one contains a sufficient supply for the feed. The mother when nursing should sit, as in this position she can better manage and control the infant if it is inclined to be restless.

If some little trouble were taken during the first ten days of the infant's existence, and those two important rules with regard to feeding were conscientiously carried out, it would save much worry and trouble to many a mother, and be of incalculable benefit to the infant.

### **Evidences of Normal Lactation.**

If the child is being regularly fed, and all other instructions are being faithfully carried out, how can one tell when he is making steady progress and thriving satisfactorily?

There are several characteristics which indicate this desirable state of affairs; the most reliable and important are the following:—

1. The child gains steadily in weight.

As this is perhaps the most important indication of its well-being, the child's weight should be registered every week in a careful and systematic manner, by means of a hook weighing-machine.

Immediately before food the baby should be undressed and wrapped in a piece of flannel kept for the purpose, the four corners of which are caught up by the hook. The result should then be read off and noted down.

A healthy child, after the first ten days, ought to put

on at least four ounces in the week. This is the minimum, and often seven, eight, or nine ounces are gained.

It will be noticed that only after the first ten days an increase in weight is to be looked for. The reason for this qualification is that all children lose weight during the first four days, but after that period, when the milk flow has been properly established and the baby is being regularly fed, it picks up again, and at the end of the tenth day has regained its birth-weight. While this initial loss may not mean very much to a healthy and vigorous infant, who quickly regains it again, it becomes a much more serious matter for the premature, delicate, or puny child, who usually takes a much longer time to recover the loss. In order to counteract, if possible, this great disadvantage, various experiments in feeding artificially during the first two or three days have been tried. The result of these, however, have been disappointing, and the conclusion has been arrived at, that even for delicate children, it is better to adhere to the usual diet, which has already been given on page 4.

2. The child sleeps well—regularly and quietly.

A healthy infant will frequently fall asleep almost immediately after food, and even if it does not do so, it lies awake quite contented and happy, whilst at night it will perhaps have a nice long sleep lasting from four to six hours. Such children are very easily managed—but, alas! all are not so well-behaved; and instead of the model baby just described, one may have to do with a most troublesome child, who cries immediately after food, and indeed almost continually; who takes no long sleeps; who whimpers at night; and in one way or another manages to disturb the house-

hold a good deal. At the same time the baby is evidently thriving—it has a good colour, and puts on weight steadily; and apart from the trouble it causes, gives no occasion for much anxiety as to its health. Now the child is most certainly suffering from some form of indigestion, and later on we shall consider the most frequent causes of this condition, and also what may be done to remedy it.

Before leaving this subject, a third type of baby may be very briefly described. It is no uncommon thing to see in the Out-Patient Department of a children's hospital, a thin, wasted child, who appears to digest its food without any discomfort; who does not cry much, and who sleeps well, but who nevertheless is not getting on. There may be no decided symptom of ill-health, but the baby fails to gain, or actually loses weight week by week; and this, it should always be remembered, is the most reliable method of judging of an infant's state of health.

Such a child, although far less troublesome than the fretful baby previously described, causes one much more anxiety.

In the one case indigestion is the root of the trouble, but in the other the child evidently does not assimilate its food—it cannot thrive, because from some cause or other it is not being properly nourished. This condition should always be brought under the notice of a doctor. Mal-nutrition, combined with good digestive power, is, however, not of very common occurrence; and as a rule the child whose digestion seems to be good gains steadily in weight, while the child who loses, or makes no gain, is usually a sufferer from digestive troubles as well.

3. The child is eager to nurse, and in from ten to twenty minutes is quite satisfied.

4. The bowels move regularly.

The healthy infant's bowels move regularly two or three times a day. The motions are of a light yellowish colour, somewhat resembling the yolk of an egg, semi-solid in consistence, and with a slight but not disagreeable odour.

Such are some of the indications by which one can judge if the baby is thriving or not, and while nothing is pleasanter and more encouraging for all concerned than to see the infant making steady and uninterrupted progress, it must at the same time be borne in mind that most babies have little ups and downs, and that some very trifling cause will often upset a child for the time being, and make him peevish and fretful.

### **Common Causes which tend temporarily to upset a Child**

During the first ten days of life it is not uncommon for the baby to have a furred tongue, and to be cross and fretful, although the mother has most conscientiously carried out all the instructions given. This need not occasion much anxiety, provided the child be strong and healthy. It often takes a few days before the breast becomes accustomed to its function of secreting milk, and during the process the milk is frequently rendered somewhat indigestible, which quite accounts for any little indisposition the baby may suffer from during that period.

It is well to remember this fact, because some young, inexperienced mothers, who are anxious to

nurse, and so give their infant every advantage, are apt to become nervous and worry over the matter—fearing lest they should be unable to perform satisfactorily this all-important maternal duty. Now, as the breast of the nursing mother is an extremely sensitive organ, and reacts very quickly to nervous impulses, this worrying and anxiety, if continued, frequently does alter the quality of the milk to such a degree that the infant continues to show all the symptoms of unsuitable feeding, and is ultimately taken from the breast, when a little advice and a few encouraging words to the mother is really almost all that is required to put matters right. Under ordinary circumstances, however, if the baby's indisposition lasts longer than ten days, some cause other than the indigestibility of the mother's milk must be sought for.

Many other little difficulties and variations not uncommon in breast feeding too often cause the baby to be transferred to the bottle, when a little knowledge, combined with patience, might soon have put everything right again, and have allowed the child to be kept on the breast—greatly to its advantage. I should like to specially emphasise this point, because in hospital work one sees so much of the disastrous results which often attend bottle feeding, and one also feels convinced that in many cases breast feeding has not had a fair and ample trial.

Let me quote a common hospital case:—

A baby, four months old,—thin and ill-nourished—is brought up for treatment. The child had been fed on the breast for the first three or four weeks after birth, but it did not seem to thrive, though the mother is a strong-looking woman, with evidently plenty of

milk. A little investigation and attention might have disclosed some easily remedied cause of the baby's condition; but it is hastily assumed that the breast milk is unsatisfactory, and the child is forthwith put on the bottle.

### **Evidences of unsatisfactory Breast Feeding**

We have already mentioned several favourable signs noticeable in the infant when lactation is normal, and it therefore holds good that when these indications are absent we have reason to fear that breast feeding is not agreeing with and properly nourishing the child.

The most important symptom of such a condition is of course the failure to gain weight satisfactorily, in addition to which the baby is apt to be fretful and whining, to sleep very irregularly, to appear uncomfortable, to suffer from colic, and to vomit frequently. The motions also often contain undigested food. These latter symptoms may, or may not, be present; but if the infant is losing weight, steps must at once be taken to discover the cause, and remove it if possible.

When no error or carelessness in the nursing of the infant can account for this, the probability is that the mother's milk is at fault, and until this is remedied no improvement can of course be made. If, however, we are to understand intelligently some of the difficulties connected with breast feeding, and how best to overcome them, it is necessary, first of all, to understand something about the composition of human milk.

### Composition of Breast Milk.

Milk, as every one knows, is a perfect food—that is to say, it contains everything essential to support life. The composition of breast milk is as follows:—

Proteid, . . .	1·5 per cent.
Fat, . . .	4·0 „
Sugar, . . .	7·0 „
Salts, . . .	0·2 „
Water, . . .	87·0 „

The *Proteid*, or curd, is necessary for the growth of the child. It is the constructive element which builds up bone and body—which makes blood and repairs waste. The salts of milk probably also help the proteid matter in this work.

*Fat*.—Fat is invariably described as the fuel of the human body. It produces heat, and without it the child has difficulty in maintaining the proper body temperature.

*Sugar*, or carbohydrates, is the energy-supplying element in milk.

### Some Causes of Unsatisfactory Breast Feeding

It will be seen that normal breast milk ought to contain proteid, sugar, fat, etc., in certain proportions. It sometimes happens, however, that one or other of these ingredients becomes either excessive or deficient, and when this occurs, difficulty in rearing the infant at the breast usually follows. A weakly, delicate state of health in the mother may produce this disproportion in her milk, and if it continue in spite of treatment, the sooner the child is taken from the

breast and placed on some other food the better. In a great number of cases, however, the irregularity yields to treatment, and a little regulation of the mother's diet, or improvement in her general health, rectifies the condition and restores the equilibrium of her milk.

But it is not only the weakly woman whose milk may become unsuitable for her infant. A nursing mother, if she feel strong and well, is often inclined to believe that her milk must consequently be good for her infant under all circumstances. She therefore frequently disregards, or even altogether neglects, certain rules as to diet, exercise, etc., which will be mentioned later on, and which every nursing mother should conscientiously follow as closely as possible. However good her general health may be, abnormal variations may still occur in her milk; and, when a mother has undertaken to nurse her child, it is her duty to conform her habits and tastes for the time being to the course of living which enables her to discharge this function most efficiently. Lastly, emotional women do not as a rule make good nurses. The doctor should impress on such mothers the great importance of avoiding as much as possible all causes of excitement, whether mental or physical; as the influence of the emotions on the nervous system changes mammary secretion, and may turn an otherwise good milk into an unsatisfactory one.

Another cause of loss of weight is the inability of the mother to secrete enough milk for the needs of her child, even when both breasts are used for the feed. This state of matters is usually indicated when the infant appears unsatisfied and cries whenever the

breast is taken away, although the feed may have lasted longer than the prescribed period, or when, on the other hand, it releases the breast after a minute or two and refuses to suck any longer.

The breasts themselves, instead of looking slightly full, as is usual just before nursing, have a flaccid appearance, and it is often difficult to squeeze even a small quantity of milk from the nipple.

Unfortunately in such cases very little can be done to increase the secretion of the milk. A liberal allowance of liquid in the mother's diet may perhaps help a little, but it is much more important to encourage her to hope that, to a certain extent at least, she will still be able to nurse her infant, as otherwise her disappointment and worry may have the effect of suppressing altogether the little milk she has.

Now, if the mother's breasts are secreting a little milk, they may perhaps be full enough to give the baby a complete feed every four hours or so; in which case, supposing the child is being fed at intervals of two hours, the breast and a bottle should be given alternately. If this even is not possible, then one breast feed, followed by two artificial ones, should still be tried. Such '**mixed feeding**,' as it is called, is always much to be preferred to complete artificial feeding, and in many cases the child immediately begins to gain weight in a most satisfactory manner. The only point to remember is that the bottle feed must not at first contain the same strength of milk as that given to a baby of the same age who has been artificially fed from birth.

### Further Evidences of Unsatisfactory Lactation

Other signs of unsatisfactory breast feeding are fretfulness, colic, and vomiting, and generally speaking they are nearly always associated with some gastric or intestinal condition of the child, or with both combined.

1. *Fretfulness*.—It must be remembered that crying is the only way an infant has of expressing itself when anything disturbs it or renders it uncomfortable. Fretfulness may therefore be looked upon as a sort of general symptom, denoting discomfort of some kind; and in nine cases out of ten it will be found that some form of indigestion is the cause of the peevishness. Breast-fed children suffer usually from what is known as 'intestinal' indigestion, and where this is so, colic and pain frequently accompany the condition and add to the baby's general discomfort.

2. *Colic*.—Colic is the bane of the infant. Very few escape an occasional attack, while every now and again one sees babies who suffer from it most persistently, in spite of all that can be done in the way of careful dieting. The continual crying and fretfulness of the little one sometimes induces the mother to take it from the breast and try instead some kind of artificial feeding—often with bad results—as the colicky condition frequently gets worse, and the child does not thrive so well. Indeed, if the mother is able to nurse, the infant should not be changed from the breast to the bottle without the most careful consideration, and then only after all other known means of remedy have failed to give relief.

The usual history of colic is as follows:—

The child has taken the breast, and perhaps half an hour later begins to cry loudly; at the same time drawing up its legs as though suffering from some griping pain. As nothing seems to pacify it, some mothers foolishly again give the breast; but though this may stop the crying for some little time, we have already explained that under these circumstances the baby has not much chance of permanently improving. Happily, however, colic is one of those infantile maladies for which a great deal can be done by careful attention and treatment.

In the first place, over-frequent and irregular feeding is very often the cause of the trouble, and when this is rectified and the baby fed at regular and stated intervals, the condition is usually promptly relieved.

If, however, the rules of feeding have always been strictly carried out by the mother, and the child still suffers from colic, some other means of cure must be tried.

Our aim in treatment should be to render the proteid or curd of the breast milk as easy as possible of digestion, and it has been proved that by increasing the length of time between the feeds the amount of proteid matter is diminished and the milk becomes somewhat more watery.

Feeding the infant, therefore, say every two and a-half hours, instead of every two hours, may often effect a cure; but if this fail, the breast milk should be further diluted by the addition of water. This can be done by giving the child one table-spoonful or so of sterilised water or lime-water, five or ten minutes before each feed.

3. *Vomiting*.—In infancy vomiting is of common

occurrence. Even the healthiest children occasionally bring up mouthfuls of milk now and again, but this need cause no anxiety whatever. If, however, a child vomits frequently, the cause must be looked for; and in this connection one is greatly helped by noting the time at which vomiting takes place. If immediately after a feed, it usually indicates that the child has taken too much. The vomiting is simply a safety-valve for the stomach, and common sense at once tells us what ought to be done. Reduce the length of time of feeding, and instead of a quarter of an hour, give the baby the breast for ten minutes only, or even less. When, however, the vomiting occurs some time after feeding (say from half an hour onwards), and is frequently repeated, one may safely assume that the baby is suffering from some form of indigestion.

If to all appearance no colic or pain accompanies the vomiting, then the stomach is generally the seat of the disturbance, and it has also been noticed that in such cases some ingredient of the mother's milk (most frequently fat—though proteid may also be the disturbing element) exists in excessive proportion. Now we have already seen that too frequent suckling causes an increase in the solids (the proteid and fat) of breast milk, and when speaking of colic, one method of treatment consisted in rendering the milk more watery by increasing the interval between each feed. In cases of frequent vomiting this remedy should likewise be tried, as well as the dilution of the milk by means of sterilised water or lime-water. A little regulation of the mother's diet and habits may also help greatly. Too much meat food tends to increase the fat in her milk, so, for the time being, a more

restricted dietary should replace her ordinary manner of living, and regular and adequate exercise should also be taken daily. If in spite of these means of treatment the vomiting is still frequent or persistent, a doctor should always be called in, as besides the various methods that may be tried by the mother, some medicinal remedies may be prescribed with good results.

Before leaving the subject mention should be made in a word or two of what is known as projectile vomiting. This is shot from the mouth with considerable force, and thus can be readily distinguished from ordinary vomiting, which comes up quite easily and without pain.

In all cases of projectile vomiting the child should be under the observation of a doctor, as it sometimes indicates a very serious condition of the stomach.

4. *Constipation*.—Constipation, though not of frequent occurrence, in breast-fed children, is nevertheless sometimes present, and may be a source of no little annoyance to the infant, as it is often somewhat obstinate in yielding to treatment. The motions are almost always paler than the normal, and may even have a distinct greyish tinge like those seen in jaundice. It is a common belief that the child may be treated and cured by dozing the mother with some laxative medicine, which by passing into her milk acts upon the infant, but like many other popular ideas, this one has little or no foundation to rest upon. Our knowledge of the elimination of drugs through the mother's milk is still uncertain; but a large proportion of those generally supposed to influence the child have no effect whatever—except that by purging the mother

they may to some extent change what was previously a good milk into one of poorer quality, in which case the child may suffer from colic, diarrhœa, etc., as a result. A safer and more effective method of treatment is to diet the mother by increasing her supply of assimilable fats and of meat, as constipation in a baby is frequently caused by the lack of a proper proportion of fat in the breast milk. If this is not sufficient to effect a cure, the child may be given one-half to one teaspoonful of cream diluted with a teaspoonful of sterilised water three times a day before a feed, or a piece of loaf sugar dissolved in tepid water and given before each nursing is also recommended.

Another means of treatment consists of gentle massage of the abdomen—night and morning. The process is described thus:—<sup>1</sup>

‘The hand should be warmed, but no oil used, the purpose being not to make friction upon the skin, but to move the skin and abdominal walls upon the intestine. This should be done with a circular motion, changing the point from time to time until the whole abdomen has been thoroughly covered. This method is only a help to other forms of treatment, as it rarely succeeds alone.’

The use of an enema is, however, the most successful means of combating constipation in an infant. A little india-rubber ball syringe somewhat resembling that used for syringing the ear should be employed, as the usual enema syringe is rather too big and clumsy; and the enema itself should consist of one to two ounces of warm water with a little yellow soap lathered up in it. One teaspoonful of castor-oil or glycerine

<sup>1</sup> Holt.

may also be added to the enema if necessary. The child is then laid on its back, and the point of the syringe, smeared with vaseline, is inserted in the anus for about half an inch. The water is then gradually squeezed out and the syringe withdrawn. This may be administered every morning for a considerable period—the only objection to its use being that it occasionally sets up an irritable condition of the lower part of the bowel, and diarrhœa is apt to ensue. On the slightest symptom of irritation, the enema must be stopped.

*Medicine.*—One should be very guarded in the use of drugs for constipation in a child. Castor-oil is probably one of the safest medicines to use. When employed for any length of time it is best given in small quantities, three times a day, the dose consisting of from five to ten drops, mixed up with a little mucilage and cinnamon water. Other useful laxative medicines are Fluid Magnesia, or the Milk of Magnesia. After the child is four or five months old, from one-half to one teaspoonful of orange juice three times a day is often very beneficial; this can be gradually increased to a dessert-spoonful two or three times a day.

**Diarrhœa.**—This is fortunately a rare condition in a breast-fed child. Should it occur, however, the breast ought to be withheld for from twelve to twenty-four hours, and two or three teaspoonfuls of albumen<sup>1</sup> water given frequently instead. At the end of twelve or twenty-four hours a short breast feed may be again given and the result carefully noted: even if satisfactory, however, feeds of albumen water ought to be given alternately with the breast feeds during the next

<sup>1</sup> See Appendix.

twenty-four hours. While the breast is withheld the milk should be drawn off two or three times a day by a breast pump, as otherwise the breast tends to become very painful.

### **Weakly and Premature Children**

For weakly or premature infants breast feeding is even more essential than for the healthy child; and if the baby is too weak to catch the nipple and suck the breast, milk ought to be drawn off three or four times a day by a breast exhauster and given to the infant in sips from a teaspoon every two hours. It may, however, in certain cases be necessary to feed the child every hour or hour and a half. The breast exhauster must be kept scrupulously clean. The glass part of it, when not in use, should lie in a solution of boracic acid and sterilised water, and should always be boiled at least once a day.

In certain cases, however, the flow of milk has not begun to be established in the mother's breast, or the milk disagrees with the infant, being probably too rich in solids. The infant then has to be put on an artificial mixture of milk and water, the strength being the same as that supplied to a full-time child. The milk, however, must be completely peptonised<sup>1</sup> before use.

In the case of a premature child, the weight must be carefully taken every day, as this is the only available indication of the progress the infant is making. The loss of weight during the first three or four days is not more marked than in infants born at full time, but recovery of this loss is much slower and gradual. The initial loss is therefore here a much more serious

<sup>1</sup> See Appendix.

matter, and every care must be taken to minimise this disadvantage as far as possible.

Weakly and delicate infants must also be kept very warm, and as much as possible at the same temperature night and day—say 70° to 80° Fahrenheit.

The ideal way to accomplish this is to place the child in an incubator; the ventilation of which is so arranged that the air which enters the box passes first over hot bottles and thus maintains the temperature at the necessary heat. Of course, it goes without saying that the bottles must from time to time be changed or refilled with hot water.

This mode of treatment, however, is rather expensive, and so cannot always be carried out, in which case the next best thing to do is to wrap the child warmly in cotton-wool and place it near the fire, with screens around to keep off all draught.

It should always be borne in mind that a warm temperature is specially necessary for a weakly or premature infant. Our bodies derive their animal heat from the food we eat, and if the child is kept too cold it tends to draw unduly on its food-supply for the upkeep of the body temperature.

In this way a certain amount of nutriment which would otherwise go to nourish the infant is spent in producing heat, and it need hardly be pointed out how highly important it is to avoid any such unnecessary expenditure.

### **Diet for Nursing Mother**

As no particular dietary can be recommended which, under all circumstances, is best for women during the nursing period, the diet of a nursing mother should

therefore not differ materially from that which she is in the habit of taking at other times, provided it consist of good, nourishing, and digestible food.

During the early period of nursing there is perhaps a slight tendency on the part of the mother to over-feed, which, when it takes the form of a liberal supply of meat and solid food, is apt to increase the solids of her milk and so render it indigestible for her infant. For the first week after confinement, milk, gruels, soups, vegetables, and bread and butter constitute the best diet; after that period a small amount of meat once in the twenty-four hours may be taken.

When the mother is able to go about again and has resumed her usual habits; the quantity of her diet may be increased, and may include meat, vegetables, milk, fruit and cereals; while during the early period of nursing, milk or cream may also be taken between meals, which should always be served at regular and proper intervals. Beer, porter, and other stimulants are popularly supposed to be very beneficial to the nursing mother, but as a matter of fact there seems to be no special advantages attaching to their use.

### **Exercise**

Exercise is so important for promoting the proper elaboration of the milk secretion, that it should always be insisted upon.

Over-fatigue, however, must be carefully guarded against, as it has a deleterious effect on the milk.

### **Sleep**

A nursing mother should try to obtain an adequate amount of sleep and rest, as these are of great import-

ance to her health. A short nap in the afternoon will often refresh her wonderfully, especially if her night's rest has been disturbed and broken.

### Care of the Nipple

Very frequently, especially when nursing a first baby, a good deal of difficulty is experienced with the nipple, which may become sore and cracked, thus causing intense pain to the mother whenever the child is put to the breast. Every nursing woman should, immediately after suckling, wash the nipple with sterilised water, dry carefully, and then place over it a small piece of cotton-wool or some other soft and clean material, in order to prevent any irritation from friction with her clothes, and also to absorb any slight overflow of milk.

Those points, though small, are not unimportant, as attention to them often prevents the occurrence of fissures or cracks in the nipple.

### Sore and Cracked Nipple

Unfortunately in some cases breast feeding has to be discontinued on account of cracked nipples, which, as well as rendering the act of nursing very painful, may at the same time open a way for organisms to enter the breast. As a result, an abscess may ultimately develop, just as a slight scratch on the finger may finally end in a poisoned arm. In all cases of fissure of the nipple it should be carefully washed with sterilised water; a little boracic acid ointment or some other mild antiseptic should then be applied to the cracks, care of course being taken that no ointment

is used which might by any chance injure or upset the infant; and finally, the nipple should be covered with a small piece of absorbent cotton-wool.

If these means prove insufficient to heal the fissures, a nipple-shield should be used at each nursing, and the same careful measures as regards the nipple itself should still be carried out. As to the shield, it should be kept in a solution of boracic acid and water when not in use, and the glass portion of it should also occasionally be boiled.

It is always advisable to squeeze a little milk into the shield just before the baby is put to the breast, so that when he begins he is rewarded by getting some milk at once, and is thereby stimulated to continue sucking. If this precaution be not taken, there is sometimes a good deal of difficulty experienced in getting the infant to suck with the shield, as he has occasionally some trouble in drawing out the milk through it.

### **Swellings in the Breast**

Another condition of the breast which requires attention is characterised by the appearance of small hard swellings, which, though not actually painful, are usually more or less tender on pressure.

These swellings are produced by a clotting of the milk in the mammary glands, and may ultimately develop into inflammation of the breast if not promptly attended to.

Whenever the hard little lumps are observed, it is best to consult a doctor without delay; but meanwhile the mother should not attempt to nurse, and the breast ought occasionally to be very gently rubbed (merely a

delicate stroking with the tips of the fingers) from the outer part of the gland towards the nipple.

From time to time the milk should be drawn off in small quantities by a breast pump, and the breast itself should be supported by some form of bandage. Under such treatment the swellings will often disappear in from twelve to twenty-four hours.

### **Inflammation of the Breast**

The affected area, sometimes the whole breast, is painful and swollen, while to the touch it is firm, knotty, and very tender. The skin may appear slightly reddened, and the veins are always dilated. The patient feels shivery, and the temperature is elevated, reaching 100° to 102° Fahrenheit.

*Treatment.*—The child should be taken from the breast and the milk drawn off when necessary. The breast should be supported by a bandage.

If the breast be very painful, a piece of boracic lint soaked in warm water, and then completely covered by jackonet or oil-silk, should be applied over the whole breast. This frequently gives great relief.

### **Difficulty in catching Nipple—Depressed Nipple**

In some few cases an infant will persistently refuse to take the nipple although it is perfectly easy to catch; but, as a rule, whenever this difficulty occurs in nursing, it is found that the nipple is either small or depressed, and cannot easily be held by the child.

This state of matters may be a source of great annoyance to both mother and infant; the latter after the first unsuccessful attempt refuses to make any

further effort to suck; while the mother often feels too weak and ill to strive to continue the performance of her maternal duties under such circumstances.

A good and conscientious nurse may be of the greatest service at this point, by encouraging the mother to patience and perseverance.

The nipple, whenever offered, should be grasped between the first and second fingers, which at the same time press slightly on the breast; in this way the nipple is pushed forward as much as possible, and a little milk is also squeezed out, which the baby tastes, and which may induce it to continue sucking.

Should this fail, however, a breast shield should next be tried, using it in the same way and with the same precautions as previously given under 'cracked nipples.'

If the infant still refuses to nurse, artificial feeding should be resorted to, but the attempt to suckle it should not be abandoned all at once, as I have seen a child take to the breast after an interval of ten days. In the meantime the milk should be drawn off frequently by a breast pump, which also helps to draw out the nipple and so make it easier for the child to catch.

### **Contra-Indications to Maternal Nursing**

It has already been mentioned that maternal nursing is as a rule far superior to any other method of feeding, but there are occasionally certain conditions associated with the mother which wholly contra-indicate breast feeding and render it unwise and unsafe. Holt lays down the following rules:—

1. No mother who is the subject of tuberculosis in

any form, whether latent or active, should nurse her infant—it can only hasten the progress of disease in herself, while at the same time it exposes the infant to the danger of infection.

2. Nursing should not be allowed when serious complications have been connected with the birth of the child, such as severe hæmorrhage, convulsions, kidney disease, and blood-poisoning.

3. No mother who suffers from epilepsy or St. Vitus's Dance should nurse her offspring.

4. If the mother is very delicate she should not nurse, since great harm may be done to her without any corresponding benefit to the child.

5. Where experience on two or three previous occasions under favourable conditions has shown her inability to nurse a child.

6. Where no milk is secreted.

‘With reference to the fourth and fifth conditions an absolute opinion cannot always be given at the outset. In cases of doubt, nursing may be allowed tentatively, the effect upon both mother and child being carefully watched.

‘In view, however, of the great value of maternal nursing to the child, the physician should encourage it, and use every means in his power to make it easy.

‘We have already mentioned the effect of nervous influences on breast milk, and very frequently these “nerve” conditions are a bar to maternal feeding. This is especially seen in mothers who have uncontrollable temperaments, who are unhappy, who are unwilling to nurse their infants, who are hurried in the details of their life, who are irregular in their periods of rest, and

in their diet and exercise. Even if their milk happens to be sufficient in quantity, it will probably be so changeable in quality as to be a source of discomfort and even of danger rather than the best nutriment for their offspring. It is far better for such mothers not to attempt to nurse, but to adopt some other method of feeding.'

Finally, one or two other conditions sometimes occur which leave the mother in doubt as to whether she should nurse or not.

*Pregnancy.*—When the nursing mother becomes pregnant, should she continue to nurse?

In nearly every case 'No,' as it is quite unusual for the mother to have sufficient vitality to nourish properly her living child and also the growing fœtus.

Under certain circumstances, however, it might be advisable to try to continue nursing; as, for example, when a weakly child is just beginning to thrive on breast milk, and the mother is strong and vigorous; these exceptional cases, however, should be left to the discretion of the doctor.

*Acute Illness.*—During an acute illness of short duration, nursing may very frequently be continued without interruption, but in no case should the interest of the mother be sacrificed for the sake of the child. In diphtheria, typhoid, whooping-cough, and severe forms of contagious illness, it is safer to stop nursing—although it has been shown that the child rarely contracts the disease. An acute and severe illness often causes the milk to entirely disappear, in which case the point is, of course, quite decisively settled.

*Menstruation.*—No absolutely definite rule can here be laid down. We must be guided by what seems best

in each individual case, but as a general rule nursing may be continued during that period if the mother be strong and well. If, however, she shows any indications of ill-health, then the child should be weaned, and in all cases probably it is best to give the baby an artificial feed during the night, if by doing so the mother can secure some undisturbed sleep and rest. In some rare cases the child has to be taken from the breast, as the mother's milk seems to affect it and produce severe digestive disturbance; but, as a rule, unless this indisposition is really serious, it is unwise to wean the child, and thus deprive it of a food on which it thrives for twenty-seven days out of thirty.

## WEANING

**Weaning** is the term used to designate the change from breast to artificial feeding. This process should, in all possible cases, be performed gradually, and ought to take from three to five weeks to accomplish.

The following table, as given by Cantley, shows how the child may be gradually taken from the breast, and artificial feeding substituted:—

	1st Week.	2nd Week.	3rd Week.	4th Week.	5th Week.
5 A.M.	Breast	Breast	Breast	Breast	Breast
8 A.M.	Mixture	Mixture	Mixture	Mixture	Mixture
11 A.M.	Breast	Breast	Breast	Mixture	Mixture
2 P.M.	Breast	Breast	Mixture	Mixture	Mixture
5 P.M.	Breast	Breast	Breast	Breast	Mixture
8 P.M.	Breast	Mixture	Mixture	Mixture	Mixture
11 P.M.	Breast	Breast	Breast	Mixture	Mixture

In the part of the book devoted to 'Artificial Feeding' tables are given to show the strength of milk suitable at various ages; but it is important to remember that in changing a child from breast to artificial feeding we should begin at first with a weaker feed than a child of the same age would be receiving who has been artificially fed from the first. For example, a breast-fed child about to be weaned at

nine months might begin with the mixture suitable for an artificially-fed child of five months. The strength of the mixture can usually be soon increased in the case of a healthy infant.

Some mothers experience great difficulty in inducing the baby to begin artificial feeding, as it steadily refuses everything except the breast. It is therefore a very good plan to give the breast-fed child, when about a month old, a bottle of sterilised water once a day. The water is, in itself, very beneficial, and when weaning begins, the child is already accustomed to suck from a bottle.

It is a common mistake to continue maternal nursing too long, as is frequently done from a natural dislike of making any change when the child seems to be thriving satisfactorily. In ordinary cases, however, it is a safe rule to make the ninth month the time for supplementing breast feeding by other food. Of course, no absolutely hard-and-fast rule as to time of weaning can be laid down, as circumstances may alter cases, and cause the infant to be weaned either earlier or later than the ninth month. Reasons for earlier weaning, such as the ill-health of the mother, or the continued loss of weight of the child, have already been noticed. Reasons for delaying weaning are not numerous, but if the child had been weakly, and was just beginning to show signs of improvement, or if it was recovering from an acute illness, weaning might be delayed for a few weeks.

The time for beginning this process should be carefully chosen, so that all conditions may be as favourable as possible. A period between the cutting of the teeth should be selected, and a time of very hot

weather, which always tends to reduce an infant's vitality, should be avoided.

If sudden weaning becomes necessary owing, for example, to severe illness of the mother, the artificial food given must at first be made very weak, and the strength gradually increased as the infant seems able to digest it.

PART II

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ARTIFICIAL FEEDING



## ARTIFICIAL FEEDING

It has been already stated in the preceding pages that the ideal food of early infancy is breast milk. This fact should be forcibly impressed on every mother, as the opinion is sometimes entertained that the baby will thrive equally well on what is known as 'hand feeding'; consequently whenever the slightest difficulty in breast nursing occurs, or sometimes even for mere reasons of convenience only, the child is deprived of its natural nourishment, and the feeding-bottle, or the patent food preparation, substituted. Nothing can really take the place of breast feeding; and when the act of nursing is performed by a careful and intelligent mother, the benefit to the infant can scarcely be over-estimated.

When this has been said, however, it must be admitted that a few exceptional cases now and then occur in which the baby for some unexplained reason does not thrive on the breast; or, as we have seen, certain conditions in the mother may debar her from nursing; and in such circumstances there is no alternative but to bring up the child by some kind of artificial feeding.

If the mother is unable to nurse, a wet-nurse is of course the best substitute from the infant's point of

view, but in this country this mode of feeding is rarely resorted to; partly, no doubt, on the score of expense, but chiefly on account of the difficulty experienced in procuring a suitable person.

### What Food to Give

We therefore look next to the milk of various domesticated animals, and we find that it contains all the elements found in mother's milk. Unfortunately, however, there exist also decided differences both of proportion and quality which frequently render artificial feeding with it a somewhat difficult and complicated problem. The milk of several animals has been experimented with—as, for instance, that of the goat, the cow, the mare, the ass, etc., but without enlarging on the various reasons for and against each, it may be said that for all practical purposes cows' milk forms the best substitute for breast milk, and the facility with which it can be obtained places it within the reach of all.

That being so, we must endeavour to modify the differences which exist between breast milk and cows' milk, so that the latter may more nearly resemble the former, which, of course, should be the standard aimed at. The following comparison of the composition of both milks reveals quite plainly considerable differences existing between them:—

COMPOSITION.	BREAST MILK.	COWS' MILK.
Proteid (Casein and Lact-albumen), . . . .	1·5 per cent.	3·5 per cent.
Fat, . . . .	4·0 „	4·0 „
Carbohydrate (sugar), . .	6 to 7·0 „	4 to 5·0 „
Salts (mineral matter), . .	0·2 „	0·7 „
Water, . . . .	87 to 88·0 „	87·0 „

*Disadvantages of Cows' Milk.*—It will be seen that the most striking difference lies in the respective amounts of the first-mentioned constituent—viz., proteid—which in breast milk is  $1\frac{1}{2}$  per cent., while in cows' milk it is  $3\frac{1}{2}$  per cent.; and, moreover, the difference is one of quality also as well as proportion. Proteid, popularly known as 'the curd,' is composed of two substances called (1) Casein; and (2) Lactalbumen.

On entering the stomach, the casein of milk is at once acted upon by a ferment called 'rennet' and converted into a curd, but the lactalbumen remains fluid and is consequently much more easily and quickly digested than the casein. Now the proteid of breast milk contains more lactalbumen than casein, the proportions being about 3 parts of the former to 2 of the latter, while in cows' milk we find that as much as 4 parts of the proteid is made up of casein and about 1 part only of lactalbumen. Further, the casein of cows' milk, when acted upon by rennet, forms a coarse, tough curd, while that of breast milk is so fine as to be almost invisible to the naked eye.

We may therefore summarise the disadvantages of cows' milk thus—

- I. It contains a much greater amount of proteid.
- II. The proteid is more indigestible than that of breast milk, as it contains a larger proportion of casein.
- III. The casein when acted upon by the ferment rennet forms a tough and coarse curd as compared with the fine curd of breast milk.

We can of course bring the quantity of proteid in cows' milk to much the same proportion as that of human

milk by simply diluting with water, but although the quantity may thereby be rendered alike, the quality still remains very different. It must be remembered also that in reducing the amount of proteid by dilution a further difficulty arises, as we have at the same time reduced the amount of sugar, fat, etc., and thrown them out of proportion to the standard found in breast milk. Lastly, another important point of difference between the two milks lies in the fact that human milk is sterile—that is to say, it contains no organisms—while cows' milk is frequently very far from being so, and thus becomes often a fertile source of disease. Cases of tuberculosis, diarrhoea, etc., in an infant very frequently have their origin in the milk-supply; and where it is found necessary to feed the child artificially, means must be adopted to get rid as much as possible of all organisms by sterilising the milk used. Later on we shall mention different methods by which this may be carried out.

### **Artificial Feeding from Birth**

In all cases where it is necessary to rear an infant from birth on artificial food it is important that definite instructions should be given regarding—

- I. The amount of food required.
- II. The time which should elapse between each bottle.
- III. The composition of the mixture.

These instructions should always be in writing, as, given verbally, they are apt to be forgotten or misunderstood, while written directions are also useful for comparison or reference should occasion arise.

## I. Amount of Feed

The capacity of a normal child's stomach at different ages has now been very accurately ascertained. Slight variations may occur, as, for instance, a very big child may require a somewhat larger feed than a small child of the same age, but speaking generally the following table may be accepted as practically correct:—

### CAPACITY.

At Birth . . . . .	1 fluid ounce = 2 tablespoonfuls		
At commencement of second month	2 fluid ounces = 4	„	„
„ „ „ third	3 „ „ = 6	„	„
„ „ „ fourth	4 „ „ = 8	„	„
„ „ „ fifth	5 „ „ = 10	„	„
During sixth	6 „ „ = 12	„	„
„ eighth	7 „ „ = 14	„	„
„ tenth	8 „ „ = 16	„	„

During the first three days of life the new-born infant should be fed in the manner already described in the opening chapter of the book. From the third day, however, a feed of 1 ounce should be given, which is gradually added to, till at the beginning of the second month the child is taking a feed of 2 ounces. By the beginning of the third month the quantity has been increased to 3 ounces, and so on in this way till the eighth month is completed.

## II. Period of Time between each Feed

In dealing with breast feeding we have already mentioned the periods of time which should elapse between the feeds. In artificial feeding the same periods should be observed between each bottle.

For the sake of convenience we restate them here.

During the first six weeks the child should be fed every two hours throughout the day, with two feeds at night if required—making ten feeds in the twenty-four hours.

The day may be reckoned either as from 8 A.M. to 10 P.M. or from 7 A.M. to 9 P.M.

From the sixth week till the end of the third month the interval should be lengthened to two and a half hours throughout the day with one feed at night, making 8 feeds in the twenty-four hours.

The day may be reckoned either as from 8 A.M. to 11 P.M. or from 7 A.M. to 10 P.M.

From the fourth month till the ninth month is reached, the bottle should be given every three hours, throughout the day (which may be reckoned as from 8 A.M. to 11 P.M., or from 7 A.M. to 10 P.M.). This gives six feeds during the day, and one feed should also be given throughout the night till the fifth or sixth month is completed, after which the night feed should be discontinued altogether.

### III. The Composition of the Feed

Until the eighth month is completed the infant's food should consist entirely of cows' milk, modified at first to approach as nearly as possible to breast milk.

Probably the most successful means of accomplishing this is got by using one or other of the two following mixtures—

(1) The milk and cream mixture, or

(2) The cream mixture,

though it must always be remembered that even the most scientific methods cannot produce a truly 'humanised milk.'

(1) **The Milk and Cream Mixture.**—This mixture is on the whole perhaps the more satisfactory of the two, chiefly because being simpler one is less likely to make mistakes when preparing it for daily use.

The tables which follow indicate its composition, and show also the varying proportions which the different ingredients should bear to each other from the first till the end of the eighth month.

TABLE I.

Composition of Feed. Beginning on third day after birth. Each feed to contain :—

Milk	= $\frac{1}{2}$ tablespoonful.
Water	= $1\frac{1}{2}$ tablespoonfuls.
Sugar of Milk	= $\frac{1}{4}$ teaspoonful.

A week to ten days later the feed should be made up in the following proportions :

TABLE II.

Each feed to contain :—

Milk	= $\frac{1}{2}$ to $\frac{3}{4}$ tablespoonful.
Water	= $1\frac{1}{2}$ tablespoonfuls
Sugar of Milk	= $\frac{1}{2}$ teaspoonful.
Cream	= $\frac{1}{2}$ „

It may here be mentioned that whenever a food prescription is given in tea, dessert, or tablespoonfuls, these quantities should not be measured out with the

ordinary tea or tablespoon, which cannot be considered absolutely reliable, as they vary so much in size. A marked measuring-glass should always be used.

We shall now examine these tables more in detail, in order to explain them in a general way.

A glance at Table I. shows that the feed measures two tablespoonfuls, which is the capacity of the normal child's stomach at birth. It will be remembered, moreover, that the quantities should be gradually increased, and Table II. shows therefore a slight increase in the amount given. This increase should be continued till at the beginning of the second month the child is taking 2 fluid ounces or four tablespoonfuls, and so on.

Turning now to the composition, we find that the first item in both tables is milk. We have already stated that cows' milk contains almost three times as much proteid matter as breast milk, and is on that account likely to prove indigestible to the new-born infant. The milk therefore is well diluted with water, in order to bring the proteid more into harmony with that of breast milk; but unfortunately we have at the same time diluted the sugar and fat and reduced them much below the standard quantity. The deficiency of sugar is remedied by adding some sugar of milk, which is of the same composition as that of breast milk, and is more easily digested than the ordinary commercial sugar. If, for reasons of economy the latter is used, it should be added in only half the quantity of sugar of milk.

Table I. still remains very deficient in the amount of fat required, which, however, is supplied about the tenth day by the addition of  $\frac{1}{2}$  teaspoonful of cream.

It is not given sooner, as the very delicate stomach of the new-born infant has at first plenty to do with the somewhat indigestible proteid of cows' milk, and a richer mixture might overtax the child's digestive powers.

It should, however, be added as soon as possible, provided the infant is digesting its food in a satisfactory manner; as mentioned above this may usually safely be done about the tenth day.

TABLE I.

COMPOSITION OF FEED BEGIN- NING ON THIRD DAY.	INSTRUCTIONS.
Each feed to contain— Milk, . . . $\frac{1}{2}$ tablespoonful. Sugar of Milk, $\frac{1}{4}$ teaspoonful. Water, . . . $1\frac{1}{2}$ tablespoonfuls.	Give every two hours during the day and twice throughout the night. The day may be reckoned as from 8 A.M. to 10 P.M., or from 7 to 9. Prepare with a measuring glass and thoroughly dissolve the sugar of milk in the water of the mixture before adding the other ingredients. The mixture to be scalded before use.

These ingredients should be very gradually increased every third or fourth day till at the tenth day the following should be given :

TABLE II.

COMPOSITION OF FEED BEGIN- NING ON THE TENTH DAY.	INSTRUCTIONS.
Milk, . . . $\frac{1}{2}$ to $\frac{3}{4}$ tablespoonfuls. Sugar of Milk, $\frac{1}{2}$ teaspoonful. Cream, . . . $\frac{1}{2}$ teaspoonful. Water, . . . $1\frac{1}{2}$ tablespoonfuls.	Same as for Table I.

Gradually increase till at the beginning of the second month the child is getting—

TABLE III.

COMPOSITION OF FEED BEGIN- NING AT SECOND MONTH.	INSTRUCTIONS.
Milk, . . . 1½ tablespoonfuls.	Gradually increase length of time between feeds, till at end of second month child is being fed every two and a half hours throughout the day, and when possible only once at night.
Sugar of Milk, $\frac{3}{4}$ teaspoonfuls.	
Cream, . . . 1 teaspoonful.	
Water, . . . 2½ tablespoonfuls.	

TABLE IV.

COMPOSITION OF FEED BEGIN- NING AT THIRD MONTH.	INSTRUCTIONS.
Milk, . . 2½ to 3 tablespoonfuls.	Same as above.
Sugar of Milk, 1 teaspoonful.	Only one feed at night.
Cream, . . . 2 teaspoonfuls.	
Water, . . . 3 tablespoonfuls.	

TABLE V.

COMPOSITION OF FEED BEGIN- NING AT FOURTH MONTH.	INSTRUCTIONS.
Milk . . 4 to 4½ tablespoonfuls.	Give feed now every three hours during the day. One feed at night.
Sugar of Milk, 1 teaspoonful.	
Cream . . . 2 teaspoonfuls.	
Water, . . . 3½ tablespoonfuls.	

TABLE VI.

COMPOSITION OF FEED BEGIN- NING AT FIFTH MONTH.	INSTRUCTIONS.
Milk, . . . 6 tablespoonfuls.	Same as in Table V.
Sugar of Milk, 1 teaspoonful.	
Cream, . . . 3 teaspoonfuls.	
Water, . . . 3 tablespoonfuls.	

TABLE VII.

COMPOSITION OF FEED BEGIN- NING AT SIXTH MONTH.	INSTRUCTIONS.
Milk, . . 8 to 9 tablespoonfuls.	Same as above, but if possible discontinue night feed.
Sugar of Milk, 1 teaspoonful.	
Cream, . . 2 to 3 teaspoonfuls.	
Water, . . 2 to 3 tablespoonfuls.	

TABLE VIII.

COMPOSITION OF FEED BEGIN- NING AT SEVENTH MONTH.	INSTRUCTIONS.
Milk, 10 to 12 tablespoonfuls.	Same as above.
Sugar of Milk, $\frac{1}{2}$ teaspoonful.	
Cream, . . . 1 teaspoonful.	
Water, . 1 to 3 tablespoonfuls.	

TABLE IX.

COMPOSITION OF FEED BEGIN- NING AT EIGHTH MONTH.	INSTRUCTIONS.
Milk, 12 to 14 tablespoonfuls.	Same as last table, but night feed should be discontinued.
Sugar of Milk, $\frac{1}{2}$ teaspoonful.	
Cream, . $\frac{1}{2}$ to 1 teaspoonful.	
Water, . 1 to 2 tablespoonfuls.	

(2) **Cream Mixture.**—Many doctors recommend this method of feeding, and the results with it are certainly very satisfactory when the children are under more or less constant and skilled supervision. The ‘milk and cream’ mixture already described has the disadvantage, due to the relatively small admixture of cream, of containing a too low percentage of fat; but the ‘cream’ mixture can be diluted to contain a sufficiently low percentage of proteid, while at the same time the percentage of fat is ample, and herein lies the chief advantage of the latter method. Experience has shown, however, that this method cannot be carried out so satisfactorily by the mother herself.

To understand the working of this method, we must first of all understand that cream is simply milk plus an extra amount of fat. Different degrees of cream can be obtained by different depths of skimming from the milk, and a suitable degree for use in infant feeding can be got by skimming off the upper third of milk

which has stood for four or five hours. The approximate composition of such a cream is as follows, and gives a ten per cent. fat instead of a four per cent. as in ordinary sweet milk:—

*Table.*

Fat,	.	.	.	10	per cent.
Proteid,	.	.	.	3·5	„
Carbohydrate,	.	.	.	4 to 5	„
Salts,	.	.	.	0·7	„
Water,	.	.	.	81	„

We now give tables of feeds of this cream mixture to be used at the various ages. It will be noticed that milk is used along with the cream for the first three or four weeks—the reason being that at the very beginning the cream has to be well diluted to bring the fat down to a suitable percentage; at the same time, of course, we are diluting the proteid, and we find that this has been reduced too much, and is not sufficient to properly nourish the child. Milk is therefore added to make up the deficiency. For convenience, and also for the sake of accuracy, each table is made up to a day's amount of food, but the time of each diet, size of feed, and general instructions are the same as given under the 'Milk and Cream Mixture.' Only twenty ounces requires to be made up at first, but as the child grows older and requires a bigger feed this has to be increased to twenty-five, then to thirty ounces, etc. This can be very easily done. If increasing to twenty-five ounces add one quarter more of each ingredient, if to thirty ounces one half more of each ingredient.

*Tables:—*

TABLE I.—*Beginning on third day.*

Cream, . . . . .	$\frac{1}{2}$ ounce.
Milk, . . . . .	1 ounce.
Lime-Water, . . . . .	1 ounce.
Water, . . . . .	$17\frac{1}{2}$ ounces.
Sugar of Milk, . . . . .	1 ounce.

The milk sugar is to be thoroughly dissolved in the water of the mixture before the other materials, milk, cream, etc., are added.

TABLE II.—*Tenth day.*

Cream, . . . . .	2 ounces.
Milk, . . . . .	2 ounces.
Lime-Water, . . . . .	1 ounce.
Water, . . . . .	15 ounces.
	—
	20 ounces.
Milk Sugar, . . . . .	1 ounce. To be dissolved out in mixture.

TABLE III.—*Beginning of third week.*

Cream, . . . . .	4 ounces.
Milk, . . . . .	$1\frac{1}{2}$ ounces.
Lime-water, . . . . .	1 ounce.
Water, . . . . .	$13\frac{1}{2}$ ounces.
	—
	20 ounces.
Milk Sugar, . . . . .	1 ounce.

TABLE IV.—*At beginning of second month.*

Cream,	.	.	.	.	5 ounces.
Milk,	.	.	.	.	none.
Lime-Water,	.	.	.	.	1 ounce.
Water,	.	.	.	.	14 ounces.
					—
					20 ounces.
Milk Sugar,	.	.	.	.	1 ounce.

TABLE V.—*From third to fourth months.*

Cream,	.	.	.	.	8 ounces.
Milk,	.	.	.	.	none.
Lime-Water,	.	.	.	.	1 ounce.
Water,	.	.	.	.	11 ounces.
					—
					20 ounces.
Milk Sugar,	.	.	.	.	1 ounce.

TABLE VI.—*From fifth to sixth months.*

Cream,	.	.	.	.	8 ounces.
Milk,	.	.	.	.	2½ ounces.
Lime-Water,	.	.	.	.	1 ounce.
Water,	.	.	.	.	8½ ounces.
					—
					20 ounces.
Milk Sugar,	.	.	.	.	1 ounce.

TABLE VII.—*From sixth to eighth months.*

Cream,	.	.	.	.	8 ounces.
Milk,	.	.	.	.	4½ ounces.
Lime-Water,	.	.	.	.	1 ounce.
Water,	.	.	.	.	6½ ounces.
					—
					20 ounces.
Milk Sugar,	.	.	.	.	1 ounce.

TABLE VIII.—*From ninth to tenth months.*

Cream,	.	.	.	.	8 ounces.
Milk,	.	.	.	.	7½ ounces.
Lime-Water,	.	.	.	.	1 ounce.
Water,	.	.	.	.	3½ ounces.
<hr/>					
					20 ounces.
Milk Sugar,	.	.	.	.	1 ounce.

### Undiluted Sterilised Milk

A third method is sometimes employed in artificial feeding, namely, that of giving sterilised milk without any dilution at all. This method is much more extensively employed abroad—especially in France, with its numerous ‘Gouttes de Lait’—than in this country. It would certainly simplify the difficult question of artificial feeding if we could get all healthy infants to thrive well by this method, but unfortunately this is not always the case.

Suppose this kind of feeding has been ordered, the first question naturally is: How can a child’s stomach, especially in early infancy, deal with the large, tough curd of undiluted milk, when the child has often considerable difficulty with the curd of well-diluted milk? The explanation is this: In this method the milk is sterilised for forty or sixty minutes, and this prolonged process of treating so alters the character of the milk, by precipitating the calcium salts, that the rennet ferment in the stomach is prevented from acting to the same extent as it otherwise would. The resulting curd that is formed is much finer, and consequently irritation of the stomach is less liable to be set up.

We must remember, however, that in infants it is in the intestine that the real work of digestion is performed, and here the disadvantage of undiluted milk is plainly seen. While some children certainly can digest the large amount of proteid matter contained in undiluted cows' milk, many others find this altogether beyond their powers, and intestinal troubles are likely sooner or later to supervene. We must always bear in mind that cows' milk is intended primarily for the use of the calf, whose digestive organs are of a much less delicate nature than those of an infant—so that in the greater number of cases of artificial feeding it will be found necessary to dilute the milk.

**The dilution of milk by liquids other than water.**  
—Instead of diluting milk by adding sterilised water, it is common to do so by adding barley water, oatmeal water, etc., in the belief that the milk is thus rendered more digestible, and also that thereby a more nourishing food is provided for the child. It has long been held that the little granules of starch contained in these waters intermingle with the curd in such a way as to prevent its becoming tough and firm; the recent experiments of Rotch and others have, however, thrown considerable doubt upon this traditional belief. As for the second point, the mixture certainly looks more nourishing, but in reality has no advantage over the other method during at least the first months of life. At birth the secretion from the salivary glands is extremely small in amount, and for the first three or four months of an infant's life is present in quantities so minute as to be of little practical value in the process of digestion. During that time, therefore, the starch contained in barley or oatmeal water cannot

be digested either by the saliva or pancreatic juice, and on this account should not form part of the diet. In later infancy these diluents may play a useful part, as they exercise a certain amount of laxative action—barley water, on account of its containing a higher percentage of starch, being the more powerful.

**Should milk be boiled before use?** Although much has already been written on this subject, widely different views on this point are still held by medical men. If we explain in a few words the respective disadvantages and advantages of boiling milk before use, we shall be better able to form an opinion on the matter.

*Disadvantages of boiling milk before use.*—One evident disadvantage of boiling milk is that thereby the taste is certainly to some extent destroyed, and it becomes less palatable; but in addition to this there is no doubt that the process of boiling has some detrimental effect on the milk itself. If we compare a number of healthy infants reared on unboiled milk, and an equal number of healthy infants reared on boiled milk, we find that the former class show a more uniformly high standard of good health and development. In other words, unboiled milk, when it can be safely used, is undoubtedly the better food for infants. But in extremely few cases can it be used with absolute safety and security. Milk, as it comes from a perfectly healthy and clean cow is sterile—that is, free from organisms. But in this country at least, where we have no very stringent oversight of dairies, where disease in cows is fairly common, and where the process of milking is far from being perfect, it is not to be wondered at that many organisms find their

way into milk and are productive of very serious results—for milk, as is well known, is one of the great carriers of disease, and many epidemics of scarlet fever, diphtheria, or typhoid can be traced to the use of milk which has become infected with germs. As these diseases, however, are not common in young infants, the danger most to be feared for them from the use of unboiled milk is either tuberculosis, caused by an organism called the ‘tubercle bacillus,’ or diarrhoea, caused by another organism commonly found in infected milk. To these two diseases is due very largely the high infant mortality in this country.

*Advantages of boiling milk before use.*—The outstanding advantage, therefore, of boiling milk before use is that by the process the germs are destroyed and the milk is safe as a food. A temperature of 163° Fahrenheit maintained for a few minutes is sufficient in ordinary cases, but if the milk has to be kept for some time the temperature must be raised to 212° Fahrenheit and kept there for half an hour. This latter is the process known as sterilisation. It can now be easily carried out at home by means of one or other of the numerous ‘sterilisers’ in the market.

To overcome the disadvantages already mentioned of boiling or sterilising milk, a process called ‘pasteurisation’ has been tried. It consists in keeping the milk at a temperature of 158° Fahrenheit for twenty minutes. At this temperature the taste and the quality of the milk are not affected. Of this method, however, it must be said, that while it kills most germs, it has not been proved to kill the tubercle bacillus.

In addition to these, we hear a good deal nowadays

of a process introduced by Dr. Budde of Copenhagen. Milk so treated goes under the name of Buddised milk. The milk is heated to 122° Fahrenheit, and to the milk is added a small percentage of peroxide of hydrogen. The mixture is then well stirred for from fifteen to twenty minutes. Dr. Budde claims for the process that it sterilises milk without at all deteriorating it in quantity. But we must remember that in thus treating milk we are introducing a foreign substance, the possible effect of which it is difficult to estimate.

### Scalding

For all ordinary purposes there is no doubt that simply bringing milk to the boiling-point and keeping it at that temperature for a minute or two, and then cooling rapidly, is a very simple and satisfactory method of procedure. This process we term scalding.

The advantages, therefore, of heating milk so far outweigh the disadvantages that, in my opinion, all milk used as food for infants ought to be at least *scalded* before use.

### The Feeding-Bottle

A form of feeding-bottle very often seen in use is that to which a long indiarubber tube is attached. There are, however, at least two serious objections to this kind of bottle, viz.:—

(1) Its use frequently results in irregular feeding. This bottle is popular largely because it can easily be propped up in the infant's crib; the teat is then placed in the child's mouth, and the mother goes off to pursue her other household duties. No harm would result

from this arrangement if one could be sure that the child would suck steadily till the bottle was empty ; but it very often happens that the infant sucks only for a few minutes and then falls asleep ; on wakening, the same process is probably repeated, the mother meanwhile congratulating herself on having 'peace to do her work.' But the inevitable result of such irregular feeding is that the baby soon shows signs of indigestion, becomes peevish, seems continually hungry, and sleeps intermittently and restlessly.

(2) Another serious objection to the use of this bottle is the impossibility of keeping the tube thoroughly clean. In spite of the most careful brushing out, after a short time a whitish fur collects inside the tube, and over this fur, which is full of organisms, the milk has to pass before reaching the child. The advantage gained by sterilising the milk is thus entirely counteracted by the dangers of the tube. It cannot therefore be wondered at that infants using such a form of feeding-bottle are so often the victims of diarrhoeal troubles.

*The Teat-Bottle.*—A really suitable feeding-bottle must have no tube attached, but only a teat, which can be fastened to the bottle just before use ; it must also be of such a shape as to admit of thorough cleaning. A number of different shapes can be seen, but the cylindrical one, which has no corners to clean out, is probably the most satisfactory. The teats can easily be procured in varying sizes to suit the child, and the best are those made of plain black rubber. The hole in the teat should be large enough to allow the milk to drop rapidly when the bottle is inverted, but not so large as to allow it to run in a continuous

stream. If the milk comes too quickly, the child's stomach is apt to be distended too rapidly, and vomiting may ensue.

The most scrupulous care of both bottle and teat is absolutely necessary. The latter, when not in use, should be kept in sterilised water or in a mixture of water and boracic acid. The bottle should, immediately after use, be thoroughly cleaned out with a bottle brush, then filled with boiled water, and so kept until it is again required.

We have now considered the usual artificial diet given to a normally healthy child, but before passing on to describe more difficult cases of feeding, a word or two regarding patent or proprietary foods may be useful.

### Patent Foods

It is well known that many infants are reared on Patent Foods, and often with less trouble than when cows' milk is used. This fact must, however, I think, be considered to a large extent as a reproach to the medical profession. How often it happens that a child is put on cows' milk while no definite written instructions are given to the mother regarding the time, quantity, and composition of the feeds! Under such circumstances, of course, the baby does not thrive, and is often sick, peevish, and fretful; to relieve the consequent anxiety of the mother, some other method of feeding is advised and a patent food frequently ordered. Now the patent-food vendor knows his business well, and has certainly grasped the fact that rules as to 'times of feeding' and 'quantity' are of the utmost importance. Full printed instructions on these

points, therefore, are issued with each tin. A great variety of patent infant foods are now in the market, and are extensively advertised as: 'a perfect substitute for mother's milk, absolutely the best food for the infant,' etc., etc. While, however, it may be granted that such foods are useful in their own place, they should always be considered more or less as a last resort as the *chief* food for the child. Children reared on patent foods are often very fat, a condition due to the excessive amount of sugar contained in the preparation. This superficial appearance of health is frequently dwelt upon with pride by the mother or nurse, who fails to understand that a somewhat thinner but firmer child is in reality much healthier than the fat but flabby infant. The chief danger of patent foods lies in their deficiency of fat, an ingredient essential to the healthy growth of a child. The proteid matter, too, on account of the dilution required, is also frequently deficient in amount, so that the continued use of such foods is full of grave risks to the infant. The muscles become soft and flabby, and often a tendency to rickets shows itself. The need for such foods is much less frequent than is generally supposed, for if cows' milk be carefully and intelligently used as a means of artificial feeding, the infant rarely fails to thrive satisfactorily upon it. It is true that very occasionally one meets with a baby whose digestive ability is of such a perplexing nature that it can apparently digest and thrive on unlikely substances, while it fails to digest more natural food; but such a case is entirely exceptional, and requires of course individual study and exceptional treatment.

Some people will no doubt disagree with these

remarks regarding patent foods. Have they not with comparatively little trouble reared on them children who appear perfectly strong and healthy? That may be so—infants, fortunately for themselves, may thrive on widely different foods and in various circumstances and conditions. The point, however, to be emphasised and borne in mind is that patent foods can never properly take the place of cows' milk as an artificial food. It is the unanimous opinion of the doctors who have devoted most time and work to this special subject, that patent foods are, generally speaking, injurious to the infant, and that they should be used only after the most careful consideration, and always on medical advice.

### **Difficult cases of Feeding**

We come now to consider more difficult cases of feeding, due to gastric or intestinal disturbance; and here we must first state that it is not possible—nor indeed practicable—to try and modify the milk, so as to meet every slight symptom of discomfort an infant may exhibit. Few babies can be brought up on artificial food without at times suffering from slight attacks of indisposition betokening some temporary disturbance of digestion; but unless these attacks become more or less continuous and troublesome they need occasion no anxiety whatever. The cases of feeding which require the most careful study and treatment are seldom those reared on good modifications of cows' milk, but rather those in which digestion, both gastric or intestinal, has been upset by the use of improper foods, by irregular times of feeding, or by both these causes combined.

## Vomiting

A very common symptom of stomach disturbance in young infants artificially fed is a tendency to *vomiting*. It may be interesting to explain here what actually takes place.

A child receives, let us say, some indigestible food, which soon causes irritation to the stomach. A message to that effect is quickly transmitted to a certain part of the brain called the 'vomiting centre,' which promptly returns an order to the stomach to get rid of the irritating material as soon as possible; this is effected by a strong simultaneous contraction of the muscles of the stomach, of the abdomen, and of the diaphragm, which causes the indigestible matter to be forced upwards and expelled by the œsophagus and mouth.

The position and shape also of the stomach of a young infant renders it peculiarly liable to vomiting.

The stomach of an older child is bag-like in shape, and is placed horizontally, while that of a younger infant has the appearance of a dilated tube and is placed almost perpendicularly. The greater liability to vomiting can therefore be readily understood.

### Common causes of Vomiting in Infancy

I. *Vomiting from over-filling of the stomach.*—We have already noticed this condition in breast feeding, and the remarks there (page 20) made in regard to it apply also to artificial feeding. This sort of vomiting is characterised by the fact that it comes on within a few minutes after feeding, and that the food is brought

up without effort and is little changed in appearance; the vomiting is frequently accompanied by eructations of gas, or by air which has been swallowed with the food.

This sort of vomiting may be regarded merely as a natural means of ridding the stomach of excessive material, and requires no treatment beyond diminishing the *size* of the feed. In artificially-fed children, this vomiting is found to proceed sometimes from the too rapid distension of the stomach caused by the hole in the teat allowing the milk to run out too quickly. As the proper rate of flow from the teat has been already mentioned, this can easily be tested, and a teat with a smaller hole substituted if necessary.

II. *Vomiting caused by handling*.—Another common cause of vomiting is the nursing and handling of an infant immediately after it has been fed. This should be carefully avoided, as it is even more important for a child than for an adult to have rest after food—this cause of discomfort, therefore, can be easily remedied by the exercise of a little care.

III. *Vomiting due to curd irritation*.—This kind of vomiting comes on somewhat later than the form already spoken of—usually from half an hour to an hour after food. Premonitory symptoms of discomfort and pain frequently occur. The vomited matter always contains curd, which explains the cause of irritation. The curd formed by the action of the rennet in the stomach has been too much for the child's stomach to deal with, and it has been unable to pass it on into the intestine. Irritation is set up and vomiting results.

Such a condition as this requires prompt and careful

treatment, as the longer it is allowed to continue, the more difficult it is to remedy efficiently.

*Treatment.*—As the failure to digest the proteid is the usual source of irritation, the first and simplest method of treatment is merely to further dilute the milk. Suppose that we are dealing with a child of three months old, who ought normally to be getting a mixture of half milk and half water; if vomiting is taking place and curdled milk is being brought up, the omission of say half a tablespoonful of the milk and the addition of half a tablespoonful of water in place of it may be tried—the mixture may be still further diluted if necessary. But while this treatment may be recommended for a short time the general health of the child, as judged by its weight, must not be allowed to suffer to any appreciable extent from a lack of sufficient proteid in the milk. If the child can be brought back to the original feed in the course of a week or so without further attacks of vomiting, well and good. But if the resumption of the original proportions of the milk—necessary for purposes of nourishment—again causes vomiting, something must be added to the milk to prevent the excessive curdling and yet allow the child to obtain a suitable amount of nourishment.

(a) *Lime-Water* may be added. Lime-water combines with milk and changes its composition to a certain extent, so that the rennet no longer has so much power of causing coagulation. The curd then formed is much finer in quality, and therefore of a less irritating nature than the firm, hard curd already described. In this finer condition it also passes much more easily into the intestine. For example, the diet

of a child of two months which would ordinarily consist of  $1\frac{1}{2}$  tablespoonfuls of milk and  $2\frac{1}{2}$  tablespoonfuls of water would be changed thus:  $1\frac{1}{2}$  tablespoonfuls milk,  $1\frac{1}{2}$  tablespoonfuls water, 1 tablespoonful lime-water.

The one objection to the use of lime-water in milk is that it has a slightly constipating effect, and if the child has any tendency in this direction it is better to add bicarbonate of soda instead of lime-water. On the other hand, the latter is much to be preferred where there is the slightest tendency to diarrhœa.

(b) *Bicarbonate of Soda* (baking soda) may be added. This has the same beneficial effect as lime-water on the curd, while it has the advantage above-mentioned of not inducing constipation. To every 2 tablespoonfuls of milk 1 to  $1\frac{1}{2}$  grains of bicarbonate of soda—enough to cover one-half of a threepenny bit—may be added.

(c) *Barley-water* or oatmeal-water may be given. Many doctors recommend diluting the milk with barley or oatmeal water, on account of their supposed mechanical action in breaking up the curd. This should not, however, be tried with very young infants, for reasons already given. (See page 54.)

(d) *Sodium Citrate*.—When the child has very great difficulty with the digestion of the curd, and when lime-water or bicarbonate of soda have not been efficacious, sodium citrate may be tried. By the addition of a certain quantity of this substance to the milk the formation of curd in the stomach can be entirely prevented. The milk then remains quite fluid, and easily passes into the intestine. The amount of citrate required to accomplish this is 2 grains to each ounce of milk.

This citrate acts by precipitating the lime salts, and we have already noted the inability of rennet to act in the presence of insoluble lime salts. For example, if a feed is being given containing two ounces of milk, 4 grains of the citrate would then be required to each feed to prevent the milk coagulating. The four grains should be dissolved out in a teaspoonful of water and then added to the feed. It is advisable, however, to have a larger quantity—say, an eight-ounce bottle—of the dissolved citrate made up by the chemist at one time, and take a teaspoonful from this mixture as required. In this eight-ounce bottle there are sixty-four teaspoonfuls, so that we would have to add sodium citrate to the amount of four grains multiplied by sixty-four. This would practically come to half an ounce. The prescription might be written thus:—

R Sodium Citrate, . ℥ss. ( $\frac{1}{2}$  ounce).  
 Water to . . . ℥viii (8 ounces).

One teaspoonful of this mixture to be added to each feed.

The child should always be under the care of a doctor when sodium citrate is given, as the treatment must not be continued too long. The stomach, for the proper discharge of its functions, requires a certain amount of work to do, and if the milk is continuously treated so that work is no longer necessary, digestive troubles are sure to occur. The child may be kept on this treatment from three to six weeks, but as soon as possible the amount of citrate ought to be reduced. This of course must be done gradually and carefully. Instead of a whole teaspoonful of the mixture being

added to the food, three-quarters of a teaspoonful may be tried. If the result is satisfactory, a half-teaspoonful may suffice, and so on until it can be discontinued altogether.

(e) *Peptonised Milk*.—Instead of the stomach and intestine digesting the proteid and converting it into peptone—in which form it is absorbed into the blood—this may be done artificially beforehand by a process known as ‘peptonisation.’ The milk may be so treated as to be either partially or completely peptonised. If completely peptonised, no curdling at all will take place in the stomach, while with partial peptonisation the curd formed in the stomach is much finer and easier of digestion than when untreated milk is used.

Peptonised milk, like citrated milk, should not be used for too long a time, and for the same reason, viz., that the stomach gets little or no work to do, and therefore tends to lose its digestive powers. Directions for both partial and complete peptonisation of milk will be found in the Appendix.

The peptonising of milk is a more lengthy and also a more costly process than the citration of milk, but it is superior to the latter in that it relieves both stomach and intestine from digestive work, while citration relieves the stomach only.

IV. *Vomiting due to excess of Fat*.—In certain cases, especially if a ‘cream mixture’ is being used, excess of fat may be the exciting cause of vomiting. This form of vomiting usually comes on from one and a half to two hours after food.

The treatment to be adopted is to reduce the amount of cream given in the feed until a satisfactory result is obtained. Sometimes even skim milk may have to

be given for some time to allow the stomach to recover its full digestive powers.

### **Intestinal Digestion.**

It must be borne in mind that during the first few months of life the intestine is the part where digestion mostly takes place, the stomach during that period acting rather as a reservoir and playing quite a subsidiary part in actual digestion; later, the stomach becomes a more important digestive organ.

Before the proteids, carbo-hydrates, or fats contained in milk can be taken up into the system, they must be acted on by the digestive juices and changed in character. Flowing into the upper part of the small intestine (called the Duodenum) is a fluid known as the pancreatic juice, having the power of converting proteids into peptones, in which form they are absorbed into the blood. It also is able to emulsify (or break up) the fats, thus rendering them digestible, while the carbo-hydrates too undergo some change in composition. In later infancy this fluid also converts starch into sugar. Another fluid, called bile, which assists the pancreatic juice in the emulsification and digestion of fat, also flows into the duodenum. Digestion, then, is a highly complicated process, and in the very young especially the working of the digestive organs is extremely easily thrown out of order.

### **Intestinal Disturbance**

Vomiting, arising from whatever cause of irritation in the stomach, may, as we have seen, occasion a considerable amount of trouble; the treatment required,

however, is comparatively simple and generally quickly efficacious. The treatment of intestinal indigestion, on the other hand, usually involves much and long-continued care.

The most outstanding symptom of this condition is colic, by which term we mean severe paroxysmal pains in the intestines. Frequent crying, constipation, or diarrhoea, paleness and furred tongue, slight fever and loss of weight are often accompanying signs of intestinal indigestion. An attack of colic, which is always more severe in delicate and highly nervous children, is not very difficult to diagnose. The child's features become distressed; it gives a sudden, sharp cry which subsides quickly, only to be renewed again and again as the paroxysms of pain recur. The abdomen will be found distended and hard, while the legs are drawn up. Naturally, the child is fretful, and rarely enjoys peaceful or prolonged sleep. In severe cases there is excessive perspiration, cold extremities, and exhaustion, due to pain and want of rest.

There may at times be difficulty in knowing whether the crying is due to colic or hunger. The child usually takes food eagerly, as this alleviates for the time being the pain in the bowel; the mistake, therefore, of thinking that the child had only been suffering from hunger is not infrequent. When colic is present, however, another attack soon recurs; and, speaking generally, the hungry child does not cry in the sudden, sharp, paroxysmal manner symptomatic of colic, but in a more subdued and continuous manner. The hardness and distention of the abdomen also, with the drawing up of the legs, are very characteristic of the existence of colic.

This abdominal pain arises either from flatulence, cramp, or both combined. Flatulence is caused by an undue decomposition of food in the intestine. As a result, gas accumulates there; the intestine not possessing sufficient muscular power to expel the gas, distention occurs, and the abdomen becomes hard and firm. Spasm or cramp of the muscular walls of the intestine in its efforts to expel the gas usually contributes to cause the pain.

### Treatment of Colic

The only satisfactory treatment of colic is careful dieting. No real and lasting benefit can be obtained from any temporary treatment, though of course temporary means of relief such as the following must be at once applied.

*Temporary Treatment.*—Nothing given by the mouth has much effect in relieving the pain, and certainly food should not be given. The object of temporary measures is to assist the child to get rid of the gas. As this is usually found far down in the intestine, it can often be expelled by the use of injections. An injection of 4 to 8 tablespoonfuls of lukewarm water should first be tried. If this is not effective, 3 or 4 tablespoonfuls of cold water, with  $\frac{1}{2}$  teaspoonful of glycerine added, may be given. This frequently affords relief. Together with this treatment warm applications by means of hot flannel or a hot water bag should be made to the abdomen. Care must be taken that the degree of heat applied is not excessive, as the skin of a child is exceedingly tender and sensitive. A heat bearable by the cheek of an adult may be safely applied

to a child's abdomen, and the application ought always to be so tested carefully before use.

In cases where colic results from cramp proceeding from a chill, injections are of little benefit, but heat may be applied as above directed. It is sometimes even necessary to administer, for sedative purposes, some preparation of opium, but as opium is always an extremely dangerous drug in inexperienced hands, and especially for the treatment of children, this should only be given under strict medical supervision.

### **Dietetic Treatment of Colic**

We have now to consider the dietetic treatment, and see if it is not possible to prevent these attacks of colic. As difficulty in digesting proteid is the common source of trouble, it is necessary first to reduce the amount of this ingredient. This can be done by further diluting the milk. This process, however, at the same time reduces the other elements, fat, sugar, etc., so that the child may not be getting enough nourishment for its growth, and may begin to lose weight. If, however, the loss is slight (2 or 3 ounces) this treatment may be continued for some days, and then the milk be gradually again increased; or, in a number of cases where proteid is at fault, the 'cream mixture' may be used, because in it the amount of proteid is less than in the 'milk mixture' while the fat is greater. If it is necessary to dilute the milk to a large extent, whey may be added instead of water, as it gives an extra amount of nourishment in an easily digestible form. If colic continues in spite of these measures, and the child's weight remains stationary or

declines, no time should be lost in putting the child for a time on partially, or completely peptonised milk. Partially peptonised milk may be first tried, and a very good form of partial peptonisation can be obtained by using Fairchild's 'peptogenic milk powder.' (See Appendix.) If this treatment does not relieve the symptoms, complete peptonisation must be resorted to.

As the child improves the amount of peptonising powder can be gradually diminished, and the length of time in which the milk is peptonised can be shortened. Sometimes even peptonising the milk fails. In that case we may try a condensed milk well diluted, which, as it contains a large amount of sugar with a very small proportion of proteid, serves very well for a temporary food.

### Constipation

Constipation in infants often occasions considerable trouble and anxiety. Holt thus describes the condition: 'Constipation may be said to exist whenever the stools are less frequent, harder and drier than normal. During the first six months infants usually have two movements a day—many, however, have only one: but if this is normal in character the child is not constipated. In other cases, although there are two or even three stools a day, they may all be small, dry, and hard, having all the character of constipated stools, and the case should be treated accordingly.' The stools of an infant fed upon cows' milk much resemble those already described under breast feeding they are, however, usually paler in colour, and slightly firmer in consistence.

*Causes.*—The causes of constipation are varied and often obscure, but in many cases it is due to a want of tone in the muscles of the intestine. The contents of the bowel, therefore, are not forced onwards sufficiently quickly, and the bowel itself becomes distended by an ever-increasing amount of matter and gas. This want of tone may be due to any weakening disease, to the indiscriminate use of laxative medicine, etc.; but in infancy these causes are more or less rare, and the condition in the majority of cases is due to some defect in the food given; the commonest being a deficiency in the amount of fat. Sometimes even the boiling or pasteurising of the milk tends to produce constipation.

*Symptoms.*—Infrequency of the action of the bowels may sometimes be the only evidence of constipation, but in the majority of cases other symptoms, such as sleeplessness, fretfulness and dulness, flatulent distension of the abdomen, are observable. Griping, colicky pains may be a very troublesome symptom, but in some cases pain is only observed when an action of the bowels is taking place. In this latter condition the movement is often accompanied by straining, and the motions may show mucus and even streaks of blood. The probable cause of these symptoms is a little ulcer or tear at the edge of the bowel produced by the passage of the hard, dry stools; but it may be caused also by a small, simple growth called a polypus. In all cases, however, where straining is evident with the appearance of mucus and blood, a doctor should be at once consulted, as this may be the first sign of an extremely dangerous condition known as intussusception.

*Treatment.*—The treatment of constipation depends to a certain extent on the special symptoms. As, however, the condition most frequently arises from some deficiency in the food, one would have first of all to take the feeding of the child into account, and here it is often found that there is too little fat in the mixture. This can be remedied by the addition of extra cream. Along with this change in the food, it is a good plan to give a dose of castor oil, a half to one teaspoonful, depending on the age of the child, so as to have the bowels thoroughly cleared out. Such a dose, however, must not be too soon repeated, as continued treatment by purgatives is very rarely advisable. Treatment by enemata, as already described (page 22) may be tried, or suppositories may be used—a slight stimulus to the lower end of the bowel being frequently all that is required to produce an action. A small piece of soap gently pushed into the anus often produces a beneficial effect, but must not be continued for too long a time, as irritation of the lower bowel is apt to supervene. In children over three months orange juice is often beneficial, given in doses of one-half to two teaspoonfuls three times a day. In all cases training plays a very important part, and the formation of good habits in regard to regularity in the action of the bowels cannot be too soon begun. This is best carried out by placing the infant on the chamber at a regular hour every day. Sometimes when a fissure or ulcer is present the fear of the pain experienced during an action of the bowels tends to prolong the condition. Attention must then first be given to treating the fissure or ulcer—the part should be carefully washed after each motion, and boracic

ointment then applied. If this has little good result, the ulcer usually improves when touched by nitrate of silver, but if not, the surgical treatment of stretching the bowel would probably have to be resorted to.

### Diarrhœa

As anything which tends to lower the general vitality of a child increases the liability to diarrhœal diseases, it is not surprising to find this disorder exceedingly common among the children of the slums, where hygienic and other conditions are often of the worst possible description. In the poorer districts of any large city, diarrhœa claims many infants as its victims; and indeed it is to this disease that a very large percentage of the tremendous infantile mortality of this country is due.

Among more healthily situated children diarrhœa is naturally not of so common occurrence, nor usually so severe in its attacks, but at all times it must be regarded as a serious condition. No case should be lightly treated, as only too frequently an apparently mild case may develop quickly into a dangerous one.

Diarrhœa is rare in breast-fed children, but in the artificially fed it is exceedingly common. Children who suffer from chronic indigestion brought on by over-feeding, too frequent feeding, or the use of improper food are especially liable to diarrhœal troubles. While there are several varieties of diarrhœa, it would serve no good purpose to describe these fully, as in even a simple form it is necessary to take the same precautions as one would do in a severe type.

*Treatment of diarrhœa.*—It is a safe plan in every case to stop all milk for twelve to twenty-four hours, and in its place to give albumen water, whey, or cold sterilised water. This should be given at shorter intervals than the usual milk diet, as the child commonly suffers from great thirst owing to the loss of fluid from the bowel. In a severe case the child may show signs of collapse, and stimulants have to be administered. Sherry whey instead of simple whey or whisky or brandy—ten to twenty drops in a tablespoonful of water—may be given every few hours. Along with this starvation diet, certain drugs are useful and their action beneficial. As frequently undigested food, etc., lying in the bowel remains a source of irritation, some laxative medicine at the beginning of the illness can safely be given. One-half to one teaspoonful of castor oil, or some five doses at intervals of every two hours of  $\frac{1}{12}$  to  $\frac{1}{6}$  grain of calomel (according to the age of the child) may be administered. If the diarrhœa still continues, some sedative medicine may be necessary—a good combination is 2 to 4 grains salicylate of bismuth with  $\frac{1}{2}$  to  $\frac{3}{4}$  grains of Dover's Powder given three times a day. The return to the original diet must be made very gradually. If a child, for example, had been getting as its ordinary diet 3 tablespoonfuls milk, 3 of water, and 2 teaspoonfuls of cream, the cream would, even after the attack of diarrhœa had entirely subsided, at first be altogether omitted and a mixture consisting of 1 tablespoonful milk, 3 water, and 2 of lime-water given. The effect of this diet should be carefully noted, and if the result were satisfactory the proportion of milk would be gradually increased and that of lime-water correspondingly decreased. The

cream should always be the last ingredient to be resumed after an attack of diarrhoea.

We have now given a line of artificial feeding up to the eighth month. We again emphatically state that nothing but milk should be given up to at least the seventh month. After this time has elapsed it is usual to gradually introduce some other food along with the milk. There is, however, no absolute necessity to vary the food at this period. If thriving well and apparently satisfied, the baby can be kept on milk only till the ninth month. In varying the food it is a good plan to begin with one of the various infant foods. This may be added at first to one meal daily; in about two weeks it can be added to two meals daily, and so gradually increased. The table on p. 78 gives an outline of such a varied diet.

All these things mentioned are, however, only accessories to the main article of diet—milk—of which a healthy child of eight to ten months ought to consume from one and a half to two pints daily.

We have now given an outline of infant feeding suitable for the first year, the most crucial period of life; if the instructions given have been carefully and consistently followed, the feeding in subsequent years should be comparatively easy, as much more variety can now be safely introduced into the diet.

## Six Feeds to be given during the Twenty-four hours.

	1ST MEAL.	2ND MEAL.	3RD MEAL.	4TH MEAL.	5TH MEAL.	6TH MEAL.
At seven months, .	Milk.	Milk.	Milk.	Milk.	Mellin's Food.	Milk.
At eight months, .	Allen and Hanbury No. 3.	Milk.	Milk.	Milk.	Allen and Hanbury.	Milk.

## After eight months Five Feeds to be given during the Twenty-four hours.

	8 A.M.	11 A.M.	1-30 P.M.	5 P.M.	10 or 11 P.M.
At nine months, .	Allen and Hanbury's or Chapman's entire wheaten flour.	Milk.	Milk, mutton, chicken or veal broth, or a cup of beef-tea.	Milk.	Allen and Hanbury.
At ten months, .	" "	"	" plus rusk and milk and yolk of egg.	"	" "
At eleven months, .	Chapman's fine oatmeal.	"	"	plus small piece of bread and butter.	" "
At twelve months, .	Oatmeal or rusks and milk.	"	"	" "	" or milk.

## APPENDIX

### PEPTONISED MILK (Roberts).

A PINT of milk, diluted with a quarter of a pint of water, is divided into equal parts—one part being heated to boiling and the other remaining cold, and the two mixed. In this way the required heat is procured for the peptonisation. Into the milk thus prepared are put two teaspoonfuls of Benger's Liquor Pancreaticus and twenty grains of bicarbonate of soda, and the milk is then placed under a cosy near the fire. If complete peptonisation is wanted it is kept thus for one hour, and then poured into a saucepan and rapidly boiled. Sweeten to taste by the addition of sugar of milk.

'Partial Peptonisation.' Instead of an hour keep only from ten to twenty minutes under the cosy, and then bring to boil.

Instead of using Benger's Liquor Pancreaticus, etc., Fairchild's 'zymine' powders may be used. They can be got at any chemist's, and are supplied in air-tight glass tubes, each containing five grains of pancreatic extract and fifteen grains bicarbonate of soda, sufficient to peptonise one pint of milk.

Partial peptonisation can be even more conveniently carried out by means of Fairchild's Peptogenic Milk-powder (in bottle). By following the directions supplied with the powder, the process of digestion is only carried far enough partially to change the casein of the milk, enough to prevent it clotting, but not enough to absolve the stomach from all further labour.

### WHEY.

To one pint of fresh lukewarm cows' milk is added two teaspoonfuls of essence of pepsin or two teaspoonfuls of liquid rennet. It is stirred for a moment and then allowed to stand until firmly coagulated. The curd is then broken up with a fork, and the whey strained off through course muslin.

## WHITE WINE WHEY.

By using sherry instead of rennet in the treatment of milk, white wine whey is obtained. The preparation of this fluid is described by Meyers and Still as follows :—‘ Ten ounces of milk were heated until just boiling, then  $2\frac{1}{2}$  ounces of cooking sherry were added and heat was applied again until the mixture began actually to “boil up,” when it was removed from the fire and allowed to stand three minutes ; the curd was then strained off through muslin.’

## ALBUMIN WATER (Cantley).

Take the white of a fresh egg and cut it in various directions with a clean pair of scissors.

Shake it up in a flask with a pinch of salt and six ounces of pure cold water ; strain through muslin.

## BARLEY WATER (Eustace Smith).

Put two teaspoonfuls of washed pearl barley into a saucepan with a pint of cold water, and boil slowly down to two-thirds of a pint, and strain.

## OATMEAL WATER (Goodhart).

Add from one to three tablespoonfuls of well-cooked oatmeal porridge to a pint of water ; heat almost to boiling-point, with constant stirring, until a smooth mixture is obtained, and strain.









